Astrophysics Explorers Program

2023 Astrophysics Probe Explorer (APEX) AO Q&A

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Q-1 For the 2023 Probe AO mission themes, is there a specific wavelength cut-off for exclusion or inclusion in order to meet the definition of a far infrared or X-ray probe? For example, can a far-infrared mission also include a mid-infrared instrument, so long as the far-infrared instrument is responsive to the objectives outlines in the Decadal Survey?

A-1 The only criteria with regards to the Probe AO mission themes are responsiveness to the 2020 Decadal Survey in Astronomy and Astrophysics, *Pathways to Discovery in Astronomy and Astrophysics for the 2020s* as provided in Sections 7.5.3.2 through 7.5.3.4. It is up to the proposer to argue that responsiveness. The Astrophysics Division will not use a wavelength to determine responsiveness, instead the standard process of external peer review will be used to evaluate responsiveness.

Q-2 The 2023 Probe AO community announcement notes that 'Participation by NASA Centers must be consistent with NASA's Center Roles policies.' Does this mean that GSFC and JPL can act as lead centers or are other centers included as well?

A-2 Center roles are found in the NASA Center Roles document, which is not publicly available. With the most recent 2022 update to the NASA Center Roles document, the Science Mission Directorate (SMD) has changed the definitions of what is considered small/medium/large missions for the purposes of the competition roles. This adjustment is based on applying inflation from 2016, when the levels were first established, to FY2023. The new language reads:

"For purposes of mission and instrument competition roles, the following definitions apply (figures are in FY23 dollars):

- Small Mission: a mission for <$225M, without launch vehicle or Mission Directorate Unallocated Future Expenses (MD-UFE). Examples: Earth Venture Class, SMEX.
- Medium Mission: between a small and large mission. Examples: MIDEX, Earth System Explorers
- Large Mission: a mission for >$600M, without launch vehicle or MD-UFE. Examples: Discovery, New Frontiers."

SMD made no changes in this update to the mission sizes that Centers can propose to. Those roles continue to be the following:

Small, Medium and Large Missions: GSFC and JPL
Small and Medium Missions: ARC and MSFC
Small Missions Only: LaRC
No Lead Mission proposal role of any scale: AFRC, GRC, JSC, KSC and SSC

Q-3 The 2023 Probe AO community announcement is ambiguous about whether or not a NASA Center's participation is required and/or expected. Is it acceptable for a mission to be proposed, for example, with only an educational/non-profit PI and an industry partner providing the mission project management, systems engineering, and so on?

A-3 The 2023 Probe AO is an open competition, and there is no requirement for NASA (Center) participation. The hypothetical example described in the question would be compliant with the AO.

Q-4 The 2023 Probe AO is based on the Science Mission Directorate Standard AO template, with an Explorer-like timeline at least for the initial stages. Would the European Space Agency (ESA) be willing to make an early, significant, commitment to an unspecified Probe if the request came from NASA Headquarters directly?

A-4 ESA cannot partner with individual proposers, only with NASA. For that reason, ESA does not participate as a partner in proposals to NASA AO competitions. Generally European member states (plus the Japan Aerospace Exploration Agency and other space agencies) partner with proposers on NASA AO competitions.

Q-5 Could the Science Mission Directorate Standard AO template be modified to allow for a larger group of 'interested scientists' to sign on to a mission, perhaps growing their involvement as time goes on to become full Collaborators or Co-Is? Currently, the standard AO discourages large teams, but some mechanism to allow early involvement without penalty could increase opportunities.

A-5 The Science Mission Directorate Standard AO discourages large teams in order to ensure there is a robust pool of potential peer reviewers. NASA encourages proposers to describe plans for expanding the science team after selection through open and inclusive processes.

Q-6 Will NASA be organizing any meetings/workshops to facilitate discussions of Probes in general to make sure potential Principal Investigators can have their ideas heard and potentially give people a chance to join teams?

A-6 NASA will not be organizing workshops along these lines. Potential organizers of such workshops are welcome to submit a proposal for NASA support to the Topical Workshops, Symposia, and Conferences program element (Appendix F.2) of ROSES.

Q-7 Our organization is funded to develop an instrument that may be relevant to the mission objectives mentioned in the Astrophysics Probe community announcement

and which could easily be adapted for space. How can we make NASA decision makers aware of our project? How can we make applicants aware of our project?

A-7 NASA does not maintain a list of people for potential participants to contact. However, there is an Astrophysics Probe Teaming Interest webpage available at https://explorers.larc.nasa.gov/2023APPROBE/teaming.html.

Organizations may express an interest in teaming with other organizations on Astrophysics Probe proposals by filling out the form on the webpage. This is not a list of organizations who are capable of teaming but is simply a list of those organizations that have asked to be included in this list. Proposing organizations are not required to team with any organization on this list. ***NASA does not endorse any of these organizations and does not accept responsibility for their capabilities or actions***.

Q-8 If ESA member nations are interested in providing contributions to a Probe, will Headquarters facilitate discussions in some way? For example, can HQ provide a list of people for Probe PIs to contact in each country to discuss possible member nation contributions?

A-8 NASA Headquarters will not be facilitating discussions. As a practical matter, contributions to NASA's PI-led, AO-initiated proposed missions are often initiated by science collaborators in another country seeking funding from their national funding agency, rather than by US proposers reaching out directly to foreign funding agencies.

As noted in response to Q-6, potential Probe proposers are welcome to submit a proposal for NASA support to the Topical Workshops, Symposia, and Conferences program element (Appendix F.2) of ROSES. As noted in A-7, there is an Astrophysics Probe Teaming Interest webpage available at https://explorers.larc.nasa.gov/2023APPROBE/teaming.html.

Q-9 Is there any maximum duration from the start of phase B until the launch readiness date?

A-9 It is anticipated that the launch readiness date will be no later than 9 years after release of the final AO. Phase B starts at the Step-2 down-selection, which is expected to be approximately 2.5 years after the final AO release.

Q-10 Why is the cost cap $1B for the Astrophysics Probe when the Decadal Survey calls for a $1.5B cost cap?

A-10 The Decadal Survey recommends a $1.5B mission cost cap. The Astrophysics Probe AO will have a $1B PI-Managed cost cap. As stated in the Community Announcement, the PI-Managed mission cost cap does not include the launch vehicle, nor does it include the NASA held reserves. Together, these elements equate to a $1.5B mission cost cap.

The $1B PI-managed mission cost cap is an increase over the Astrophysics Probe studies. The studies had a $1B cost target including launch vehicle (but not including NASA held reserves).

Q-11 In the answer to Q-10, it is noted that launch vehicles are not part of the PI Managed Cost Cap (PIMCC). Given that launch vehicle (LV) costs were assumed to be $150M in 2018 dollars for the probe studies, wouldn't the PIMMC still be below the recommended amount in the Decadal Survey in 2023 dollars when inflation is taken into account?

A-11 Here is the Probe costing information that was used. The Decadal Survey probe studies were done at $1B cost cap including LV @ $150M in Fiscal Year 2018 dollars. Using the NASA New Start Inflation Index, $850M in Fiscal Year 2018 dollars = $950M in Fiscal Year 2023 dollars. So $1B PIMCC is an increase of $50M in Fiscal Year 2023 dollars over the probe studies done for the Decadal Survey.

Q-12 The probe studies done for the Decadal Survey assumed that the Probe would be a NASA Class B mission. Is this assumption still correct?

A-12 No, the Probe mission will be a Class C mission. The definition of a Class C mission can be found in NPR 8705.4A, which can be found at https://nodis3.gsfc.nasa.gov/.

Q-13 In the answer to Q-5, it is noted that NASA discourages large teams in order to ensure there is a robust pool of potential peer reviewers. If we have people we consider to be part of our science working group, because they have expressed support for the project and/or provided some ideas, but who do not expect to be directly funded as part of the proposal, must we list them as collaborators?

A-13 The science team should be the people who have committed to do specific pieces of the work to be evaluated. Collaborators are committed to realizing the proposed science investigation. Other scientists who merely benefit from the mission's existence, because they will do science with it, are "endorsers" not collaborators. In addition, other people who worked on the proposal, and are therefore biased also need to be identified. They should be listed in the conflicted-parties spreadsheet, according to what they did – contributed ideas, red-teaming etc.

Q-14 The Astrophysics Probe AO Community Announcement states that "The value of the contributions to the science payload may not exceed one-third (1/3) of the payload." How is the 1/3 metric defined since different partners define costs differently?

A-14 If a proposal includes one or more contributions, the proposal shall separately identify all contributions, including hardware as well as labor and services, the organizations providing the contributions, and the organizations providing the funding for the

contributions; the costs for the contributions shall be separately identified. Values for all contributions of property and services must be established in accordance with applicable cost principles. Non-NASA contributions to the science instruments are not to exceed one-third (1/3) of the PI-Managed Instrument Cost. The "PI-Managed Instrument Cost" is defined as the sum of the costs assigned to elements 4.0 (Science) and 5.0 (Payload(s)) in the standard Work Breakdown Structure.

Q-15 The answer to Q-2 suggests that GSFC and JPL are the only NASA centers allowed to propose. It is not clear that there is sufficient Bid and Proposal (B&P) funding available at both GSFC and JPL to support a healthy number of proposals for each of the two mission types. What is being done to address this?

A-15 This is an open solicitation. As such, NASA HQ does not determine what organizations will propose. Any organization may propose, including a NASA Center (consistent with their Center role), another Federal agency, a Federally Funded Research and Development Center (FFRDC) or University Affiliated Research Center (UARC), industry, or academia may propose. By extending the proposal period and coordinating the schedule for other SMD AOs, NASA HQ has created space for additional proposals to be submitted.

Q-16 Are there any opportunities for early technology funding now in order to advance TRL of some key components on time to meet the probe timeline?

A-16 The Astrophysics Research and Analysis (APRA) element of the Research Opportunities in Space and Earth Science (ROSES) program is one NASA Astrophysics mechanism for advancing Technology Readiness Level (TRL). APRA investigations may advance technologies anywhere along the full line of readiness levels, from TRL 1 through TRL 9. The Strategic Astrophysics Technology (SAT) element of ROSES is another mechanism for advancing TRL. SAT supports the maturation of key technologies for potential infusion in spaceflight missions to enable implementation of Astrophysics strategic missions. The SAT program is designed to support the maturation of technologies whose feasibility has already been demonstrated (i.e., TRL 3), to the point where they can be incorporated into NASA flight missions (TRL 6–7). PIs are encouraged to propose to the appropriate program. Note that NASA has been investing in Probe-enabling technologies under SAT for several years as part of an intentional strategy of having a rapid Probe AO following the release of the Decadal Survey.

Q-17 How would a contribution of a launch by a foreign partner be treated? Would it be allowed? Would it allow increasing the PIMCC?

A-17 As stated in the community announcement, NASA will provide standard launch services on a single launch vehicle outside the cost capped PIMMC. No other access to space option will be available in this AO.

Q-18 Would it be possible for the launch services information summary to include LV mass capability to low inclination Low Earth Orbit (LEO)? Ideally this would be in the form of a plot of LV PL mass capability to orbit inclinations down to 0 degrees over a range of altitudes from about 400 to 1,000 km and would allow for heavy payloads.

A-18 NASA intends to publish a Draft Launch Services information summary document in the Program Library at the time of Draft AO release. The performance curves in the document will include options for LEO 0 deg, 5 deg and 10 deg inclination in addition to higher, more typical inclined launch orbits. Note that consistent with the community announcement, the standard launch performance capability will be consistent with an intermediate class Commercial Launch Vehicle. Additional capability might be offered at the cost of a decrement to the AO Cost Cap.

Q-19 How will the GO/GI programs be evaluated (including but not limited to their value in Form A, requirements in Form B, cost implications in form C, additional page allocations, etc.)

A-19 Please see sections 7.2.2, 7.2.3, 7.2.4, and Requirement B-4 and the Proposal Structure and Page Limits table, in the Draft Probe Announcement of Opportunity, which can be found at https://go.nasa.gov/Hertz15.

Q-20 Should the Science Traceability Matrix have a main science goal, with several secondary goals, as an Explorer mission would have, or should it answer a range of science questions?

A-20 Please see section 5.1 in the Draft Probe Announcement of Opportunity, which can be found at https://go.nasa.gov/Hertz15.

Q-21 In an answer to a previous question on the community announcement, a response indicated that the Probe Missions would be classified as "Class C"; however, for NASA's Class C classification, the mission's duration is limited to 3 years. Will 3-year mission proposals be accepted and evaluated the same as a longer proposed mission that would need to be Class B, and will Class B mission proposals be accepted?

A-21 As noted in response to Q-12, as discussed in Appendix C of NPR 8705.4A, the considerations provided there are not definitive, nor is any specific mission criterion alone intended to be the ultimate driver to designating a mission or instrument risk tolerance class. Ultimately, the mission or instrument risk tolerance class is designated by the Mission Directorate in accordance with paragraph 3.1.4 of NPR 8705.4A. The NASA Science Mission Directorate (SMD) has approved the Astrophysics Probe risk classification of Class C and a prime mission of five years in order to maximize the science achievable within the cost cap.

The intent is to allow proposers to propose the design features, the safety and mission assurance practices, etc., they deem most appropriate and cost-effective, to maximize the science successfully achieved within the cost cap for a five-year prime mission. Proposers may choose to propose specific features from a higher risk classification if it enables their design to show compliance with the 5-year mission life while remaining within the cost cap. A proposal for a Class C mission that meets all the Class B requirements would be compliant with the AO, and would be evaluated against Class C requirements. Proposers can propose a mission duration <5 years if they believe they can provide sufficient science value with a reduced mission duration while staying within the cost cap. Proposer should not propose a mission duration <5 years solely based on mission risk classification.

Q-22 Requirement B-6 in the AO requires a Microsoft Project Schedule file, but Requirement B-48 calls for only a table of dates. Which is required?

A-22 Only a table of dates is required as described in Requirement B-48. Requirement B-6 will be amended accordingly in the Final AO.

Q-23 Do Collaborators have to spend 10% of their time on Phases A – D integrated or in every phase? Teams are built based in the specializations of collaborators and it is expected that they will have fluctuating levels of responsibility during Phases A through D.

A-23 The expectation is that it will be 10% on average over Phases A-D, not in every Phase.

Q-24 The draft AO [Section 5.4.3] reads: "It is expected that collaborators will spend at least 10% of their time dedicated to working on the mission over the course of Phases A-D." The requirement that Collaborators be unpaid and also dedicate at least 10% of their time to the mission is unreasonable.

A-24 Collaborators contributing to the mission are not expected to be unfunded. The assumption is that they are funded by resources other than that budgeted under the Probe. Inclusion of collaborators with less than 10% of their time allocated to the mission over the course of Phases A-D must be justified.

Q-25 Is it a formal requirement that a proposed concept fits cleanly into the definitions of either a pointed mission or a survey mission? Can a hybrid mission with >30% but <100% of the time dedicated to either directed science observations and/or a survey be proposed?

A-25 The definitions of a pointed mission and a survey mission are intended as guidance. It is up to the proposing teams to define their mission. A proposed mission could be a hybrid of a survey and a pointed observatory mission, and then 70% of the pointed observatory program would be required to be available to general observers.

Q-26 Who is the Point of Contact (POC) at Launch Services for non-standard payload accommodation?

A-26 The POC for Launch Services is listed in the "NASA Launch Services Information Summary, Rev. 1", which is item #4 under "Program Specific Documents" in the 2023 Astrophysics Program Library, located here: https://explorers.larc.nasa.gov/2023APPROBE/programlibrary.html.

Q-27 The requirements for institutional letters of commitment are inconsistent. Section 5.8.1 says they are required: Institutional Letters of Commitment signed by an institutional official must be provided from (i) all organizations offering contributions of goods and/or services (both U.S. and non-U.S.) on a no-exchange-of-funds basis and (ii) all major partners in the proposal regardless of source of funding. See Appendix B, Section J.2, for additional detail. However, appendix J.2, Requirement B-63 only requires letters for contributions. Which is correct?

A-27 They are both correct. Requirement B-63 is not exclusive. Requirement B-63 expands on earlier requirements for parties that are required to submit letters, e.g. requirements 35 (SCaN), 88, 91 (contributions) and 92 (major partners).

Q-28 Section 5.6.7 says "The requirement for institutional Letters of Commitment for contributions does not apply to contributed support for Co-Is and collaborators." Section 5.8.2 says "No Institutional Letters of Commitment are required for individuals in the Step-1 proposal, unless the individual's effort is contributed and the individual is part of the Proposal Team, collaborators excepted." Which is correct?

A-28 Section 5.8.2, "No Institutional Letters of Commitment are required for individuals in the Step-1 proposal, unless the individual's effort is contributed and the individual is part of the Proposal Team, collaborators excepted" is correct. The inconsistency will be fixed in the final AO.

Q-29 The prescribed likelihood and cost table in Requirement B-51 does not cover all risks, *e.g*, a risk of on-orbit failure could have no cost impact but could be mission ending. How will this be addressed?

A-29 The risk table requirement in the final AO will not prescribe the format.

Q-30 An observatory requires time to reach orbit, checkout the spacecraft, commission its instruments, and routinely interrupt science observations for maintenance activities. Does the 5 year minimum "science mission duration" and "prime mission operations" (Sections 4.1.4 and 5.1.4) include this non-observing time?

A-30 NASA defines prime mission as beginning after launch, early operations, and commissioning. The prime mission requirement is five years of calendar time, which includes observing as well as all necessary overhead and engineering time.

Q-31 For a pointed observatory, does the ≥70% of "mission observation time" requirement for the general observing (GO) program (Requirement 17) include normal operations (i.e. slewing, settling, desaturating reaction wheels, communicating, etc.) that could reduce observatory efficiency?

A-31 Yes, in the relevant proportion. It is expected that, like JWST, Probe time allocation policies will explicitly attribute the time required by indirect overhead activities to individual observing programs. The more usual policy of space- and ground- based observatories is to make such costs invisible to the user, by reducing, ab initio, the total time available for science by the time required for overhead activities such as instrument calibration and observatory maintenance. Exposing the time needed for indirect overhead activities provides total cost accounting that will allow the overall observatory efficiency to be more transparent to users and improves general accountability. These will be clarified in the final AO. To see JWST policies, please visit https://jwst-docs.stsci.edu/jwst-opportunities-and-policies/jwst-general-science-policies/jwst-observing-overheads-and-time-accounting-policy.

Q-32 What is the relative weight in the evaluation of the PI-led science (evaluation criteria Factors A-1 to A-3 and B-1 to B-5) versus the general observing or guest investigator program (new evaluation criteria Factors A-4 and B-6)?

A-32 Individual factors are not weighted. Form A and Form B will each receive one overall rating which will be based on the major strengths and major weaknesses across all factors.

Q-33 In providing details of the general observing (GO) and guest investigator (GI) program in the proposal, are proposing teams allowed to prescribe any of the programmatic details for the GO/GI program in our proposal?

A-33 Proposing teams may propose programmatic details for GO/GI programs, and those details will be evaluated as part of the review process. NASA is responsible for the GO/GI program, and final constraints will be negotiated between NASA and the selected Probe team.

Q-34 For the new cost and unencumbered reserves required during Phase E (Requirement 76: Proposals shall include a minimum of 25% unencumbered cost reserves on *mission operations* and 10% on the PI-led science investigation against the cost to complete Phase E"), does this mean that 25% reserve is required for Phase E-F on WBS 1,2,7,9; and 10% on WBS 4?

A-34 Mission operations in Phases E-F includes everything except WBS 4.

Q-35 If the PI of an APEX proposal is at a non-NASA government institution and the management organization is a non-profit private research institution (that is not a NASA center), is it allowed for the Probes office to fund the managing institution directly, rather than sending all the funds to the PI institution and having them put the funds on contract?

A-35 It would be outside our normal policy for the Program Office to fund a non-government managing organization when the PI is at a government organization, but it may be possible given a compelling reason. Note that if there is any NASA Center or other government agency involvement as part of the proposing team, they would be funded directly.